

Reducing the Risk of Roof Collapse from Snow and Ice Buildup

Major winter storms can produce heavy, wet snow and drifting from high winds —the perfect scenario for roof collapse! But how much is too much and when should snow removal be considered?

As a general rule, snow/ice accumulation should be removed when one half of the “live load capacity” of the roof is reached. The live load capacity for a roof is the weight allowance for temporary or movable loads. Snow, ice and rain water accumulation on a roof are included in the live load capacity of a roof. Live load capacity requirements for roof construction differ depending on a variety of factors including local snowfall history (ground snow load) and elevation. You will need to determine live load for each facility individually. If you don’t already know the live load capacity for your facility(s), you may want to refer to your “as built” plans for the facility or consult with a structural engineer. Once you have determined your roof’s live load capacity, which is usually expressed in lb/ft², you will probably want to convert this to a measurable snow depth as this is easier to measure than the actual weight of the snow. The weight of moderately wet snow is often estimated to be one pound per square foot per inch of depth or 12 lb/ft³. Using this number as an average, you can determine what is a safe depth of snow for your roof. Once this depth is reached, you should initiate your snow removal procedures. If snow tends to drift and accumulate on parts of the roof, take your depth measurements in the drifts to determine if it needs to be removed.



Example—

- Live Load Capacity (as determined through structural analysis) = 48 lb/ft²
- One half Live Load Capacity = 24 lb/ft² = 2 ft of moderately wet snow, or 1 foot of heavy wet snow

IMPORTANT: Very wet, heavy snow can weigh as much as 24 lb/ft³. This type of snow will require you to initiate your snow removal process sooner.

Snow Removal Safety Guidelines:

- Provide safe access to the roof
- Plan safe means for lifting snow removal equipment onto the roof
- Clearly mark roof edges and provide fall protection where there is a risk of falls
- Ensure that employees wear proper clothing for cold weather, including proper footwear
- Never allow employees to work alone. Institute a buddy system to ensure everyone gets off the roof safely
- Care should be taken not to damage a roof during the snow removal process. Avoid removal within two inches of the roof membrane.
- Consider contracting out rooftop snow removal to a licensed and insured firm that specializes in this work

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Types of construction and building features that are more susceptible to collapse:

- Structures with large spans such as auditoriums, gymnasiums and garages
- Unheated or intermittently heated structures
- Slightly sloped or flat roofs
- Roofs that tend to collect drifting snow
- Roofs without drainage, poor drainage or poorly maintained drainage systems
- Structures that have previously collapsed

Here are some additional things to look for to determine if your roof is at increased risk for collapse:

- Roof leaked during the winter or started to leak last spring
- Ripples or bends in metal supports, or cracks in wooden members
- "Popping" noises have been heard (this may indicate rivets have broken)
- Pooling of water on the roof where it has never accumulated before
- Obvious deformations in the roof

Plan to have staff perform regular, periodic inspections of all roofs as well as roof supports during and after heavy snowfall.

Remember, your employees' safety is paramount. Never allow anyone to enter a building or go up on a roof that you suspect may be unsafe.

For further information, please feel free to call your Risk Management Services Consultant at (800) 698-2364.

For a list of structural engineers in the State of New Hampshire who can assist you in determining your roof's live load capacity, see the Membership Directory of the Structural Engineers of NH at www.SENH.org.

SENH is a not for profit organization of structural engineers practicing in the State of NH. You can also find information about local structural engineers from the NH Joint Board of Engineers at 603-271-2219.